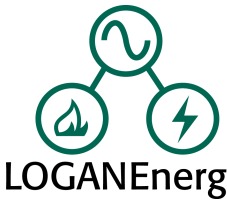


W91321-04-C-0023

LOGANEnergy Corp.

MCBH Kaneohe Bay PEM Demonstration Project

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY03

MCBH Kaneohe Bay, Senior Officer's Residence

14 September 2004

Executive Summary

Under terms of its FY'03 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy will install and operate a Plug Power GenSys 5kWe Combined Heat and Power fuel cell power plant at MCBH Kaneohe Bay, Hawaii.

This project had its genesis with LOGAN's original submittal in the CERL BAA FY'01 PEM Demonstration Program. Since natural gas is not available in Hawaii, the site had to be withdrawn once it became obvious that product manufacturers would not be able to deliver a reliable LPGas fuel cell for the project. Then in the summer of 2002, when the first LPGas PEM systems became available, LOGAN decided to reapply for the Hawaii site. After determining that the base still supported the initiative, LOGAN resubmitted the Kaneohe proposal in June 2003.

At this point the installation plans are well under way. The unit will be sited at the base housing quarters of Marine Corps Major James Blain. It will be electrically configured to provide grid parallel/grid independent service and also thermally integrated with the residential hot water heater. Local electrical and mechanical contractors will be hired to provide services as needed to support the installation tasks. It is anticipated that the project will add an additional $1,042 energy costs to the base during the period of performance.

The base POC for this project is Stephen Butala whose coordinates are:
Email ButalaSG@mcbh.usmc.mi
Telephone 808-257-2171, ext 258

Table of Contents

Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities

1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM FY 2003 Demonstration Project at MCBH Kaneohe Bay, Hawaii.

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation

1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCor 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Scott Wilshire is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1338, and his email address is scott_wilshire@plugpower.com.

4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

Contract: Four-year PC25 PM Services Maintenance Agreement.
In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability.

b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Patuxant River, MD. .

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work and continues to provide service and maintenance during the period of performance.

c) Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison
A Partner LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA. The fuel cells also provide low-grade waste heat at 140 degrees F that furnishes thermal energy to 98 water source heat pumps located throughout the 12-story building during the winter months.

7.0 Host Facility Information

Marine Corps Base Hawaii
Supporting Readiness and Global Projection

Marine Corps Base Hawaii (MCBH) Kaneohe Bay is located on the windward side of Oahu, approximately 12 miles northeast of Honolulu. The base occupies the Mokapu Peninsula, which connects to the mainland near the cities of Kaneohe and Kailua. At MCBH Kaneohe Bay, the headquarters provides administrative, housing, legal, logistical, morale and recreational support services. MCBH Kaneohe Bay is home to III Marine Expeditionary Forces, Hawaii, 1st Radio Battalion, and the Marine Corps Air Facility, Kaneohe Bay. The base's position in the Pacific makes it an ideal location for strategic deployment to the Far East. The base is also a leader in environmental protection, enhancement and conservation. The base has received numerous awards for its efforts, including the 1984 Secretary of Defense Environmental Quality Award and the 1992 Secretary of the Navy Natural Resources Conservation Award.

The main access to the base is by either highway 3 (H-3) or by Mokapu Road. Other training areas include Bellows Air Force Station eight miles to the south, the Kahuku Training Area approximately 33 miles to the north and Makua Military Reservation (MMR), which is 47 miles to the west. MCBH Kaneohe Bay has a 7,500 feet runway and supporting taxiways, which, in addition to normal air operations, are used for access to the outer island training areas. The base also has a fuel pier and waterfront area, used for loading tank landing ships (LST's) and small boats for transporting equipment off-island.

The base consists of 2,951 acres of fee simple and ceded land. Only a portion of the area (140 acres) is used as a small arms range and impact area, which is included in the DOD major training assets total. The majority of the base is located on land designated as Urban. Two sections of the base are classified conservation land, which includes the Ulupau Crater area and the Nuupia Pond area. The land south of the base is used mainly for single-family residences.

The electric service provider for MCBH Kaneohe Bay is Hawaii Electric and the LPGas provider is Aloha Gas.

The map pictured below shows the location of MCBH Kaneohe Bay relative to other geographic areas and points of interest.


MAPQUEST
0
1mi
1km
Kahaluu
Kaneohe Bay
McBh Kaneohe Bay
Ahuimanu
Kahekili Hwy
Heeia
Haiku Rd
Oahu
Malae
Kaneohe
H3
Mahinui
Kokokahi
Mokapu Blvd
Kailua Bay
Heeia Stream
© 2004 MapQuest.com, Inc.; © 2004 NAVTEQ

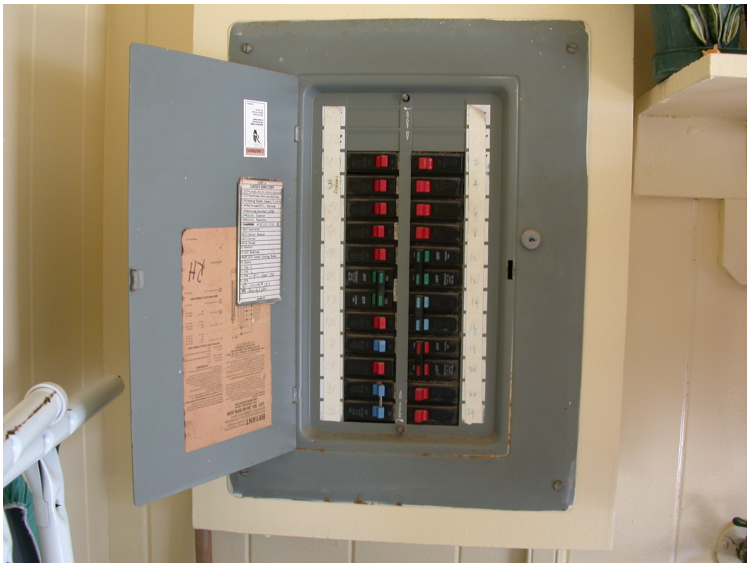
8.0 Fuel Cell Site Information

The photo below left shows the front elevation of the residence occupied by Major James Blain and family. After conducting a preliminary site visit with the POC on September 9, 2003, and following discussions with the Major, LOGAN and the base POC reached consensus that the residential site provided the best opportunity to display the fuel cell to best effect. The electric interface is within 20 feet of the fuel cell pad site, which will be located at the left rear corner of the home pictured in the photo at right below.

Since natural gas is not available in Hawaii, LOGAN has selected an LPGas fuel cell for this project. A 250-gallon LPGas fuel tank will be place in the foreground of the small tree pictured at right to store fuel for the fuel cell. While operating at a power set point of 2.5kW, the Plug Power GenSys5P fuel cell will consume .53 gallons of LPGas per hour. This equates to 20% electrical efficiency, which is low by conventional power generation standards. However, this is a first generation LPGas fuel cell, and the more important issue is to determine that the product functions in accordance with its design specifications and achieves 90% availability during the test period. If thermal recover is added to the efficiency equation, then overall efficiency could exceed 55% under ideal circumstances.

9.0 Electrical System

The Plug Power GenSys5P PEM fuel cell power plant provides both grid parallel and grid independent operating configurations. This dual capability is an important milestone in the development of the GenSys5 product, and for the PEM Program itself, as it is a significant developmental step on the pathway to product commercialization.
The unit has a power output of 110/120 VAC at 60 Hz, and when necessary the voltage can be adjusted to 208vac or 220vac depending upon actual site conditions. The photo above shows the electrical service panel in at the rear entrance to the Major's residence. Note the cover plate over the electric meter base indicating that electric service to the facility is not independently metered. However, LOGAN will install a wattmeter at the fuel cell pad to monitor the fuel cell service to the home on both the grid parallel and grid independent fuel cell conductors.



The photo at right shows the electrical distribution panel located inside the home. The fuel cell grid parallel conductor will connect to this panel at a spare 60-amp circuit breaker and provide up to 45 amps electrical service to residential loads. A new fuel cell emergency panel will be installed adjacent to this panel in order to provide up to 35 amps of stand-by power should the utility grid fail during the test period.

10.0 Thermal Recovery System

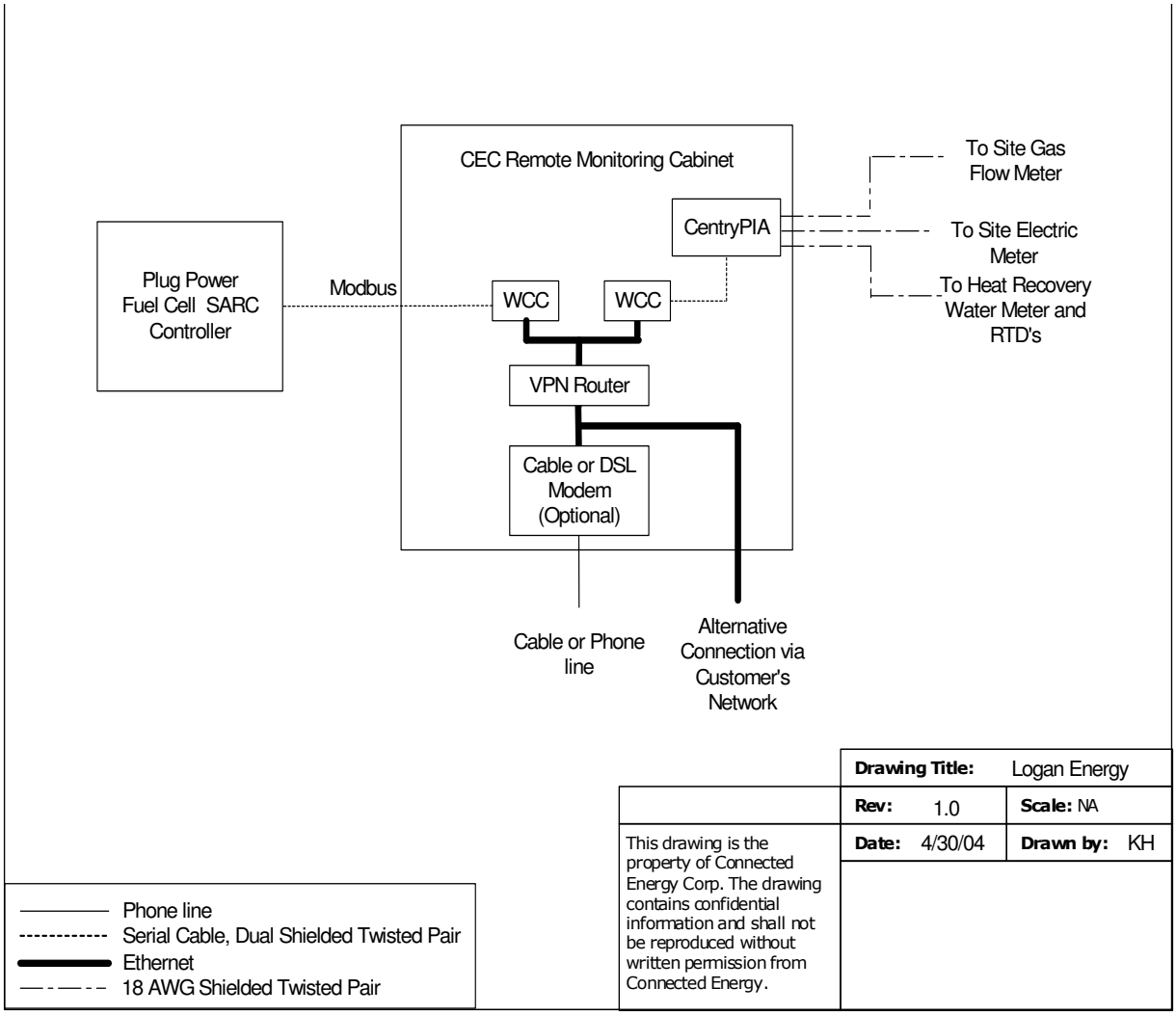
While operating at a power set point of 2.5kW, the GenSys5P circulates 8,000Btu/H of 140 degree F. hot water through a customer heat exchanger. If the is no demand for heat, the unit rejects process heat through an air-cooled radiator. In order to capture this thermal energy and provide it to the home, LOGAN will install a Heliodyne heat exchanger to transfer the heat to the existing residential hot water heater, pictured in the photo above at right.

The Heliodyne, shown in a similar residential application in the photo at left, is an insulated "U" shaped coil within a coil design that provides double wall protection between the heat source and the heat sink. It was designed primarily for the solar heating industry, but has proved to be very adaptable to the fuel cell industry as well. The Heliodyne will mount either directly to the storage tank or on an adjacent wall. It has its own pump that circulates the residential tank in a counter flow against incoming hot water provided by the fuel cell's heat exchanger. While residential heat recovery is not the most cost effective or efficient use of the fuel cell thermal load, the demonstration provides an opportunity to evaluate the effectiveness of the heat transfer system and refine installation methods.

11.0 Data Acquisition System

LOGAN will install a Connected Energy Corporation web based SCADA system that provides real time monitoring of the power plant. The schematic drawing seen below describes the architecture of the Terminal Unit hardware that will support the project. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, notification, and reporting functions. The system will capture and display a number of fuel cell operating parameters on functional screens including kWh, cell stack voltage, and water management, as well as external instrumentation inputs including Btu transfer, fuel flow, and thermal loop temperatures. Connected Energy's Operations Control Center in Rochester, New York, collects, stores, displays, alarms, archives site data, and maintains connectivity by means of a Virtual Private Network link to the fuel cell. LOGAN will contract with a local Internet Service Provider to provide high-speed Internet service.

CEC WEB enabled SCADA terminal hardware.



12.0 Economic Analysis

MCBH Kaneohe Bay PEM Project						
1) Water (per 1,000 gallons)		$	0.85			
2) Utility (per KWH)		$	0.130			
3) LPGas (per gallon)		$	1.00			
First Cost				**Estimated**	**Actual**	
Plug Power 5 kW SU-1				$ 75,000		
Shipping				$ 4,800		
Installation electrical				$ 4,875		
Installation mechanical, LPGas & thermal				$ 14,000		
Web Package				$ 2,000		
Site Prep, labor materials				$ 375		
Training				$ 4,500		
Technical Supervision/Start-up				$ 3,000		
Total				**$ 108,550**		
Assume Five Year Simple Payback				$ 21,710	$ -	
Forcast Operating Expenses	Vol/hr		$/Hr	$/ Yr		
LPGas gallons	0.5300	$	0.53	$ 4,178.52		
Water Gallons per Year	14,016			$ 11.91		
Total Annual Operating Cost					$ 4,190.43	
Economic Summary						
Forcast Annual kWH			19710			
Annual Cost of Operating Power Plant		$	0.213	kWH		
Credit Annual Thermal Recovery Rate			($0.0297)	kWH		
Project Net Operating Cost		$	0.183	kWH		
Displaced Utility cost		$	0.130	kWH		
Energy Savings (Cost)			($0.053)	kWH		
Annual Energy Savings (Cost)			($1,042.72)			

13.0 Kickoff Meeting Information

On Friday October 22, 2004, the kick-off meeting will take place at MCBH Kaneohe Bay. Dr Mike Binder will be representing ERDC CERL, and Sam Logan will be representing LOGANEnergy. Steve Butala, MCBH POC, has indicated that they would like to proceed as soon as possible. The meeting will discuss the purpose and scope of the project, and describe the responsibilities of the parties. All MCBH project stakeholders have been invited to attend. If any issues remain unresolved following the meeting, they will be resolved prior to commencing the project. The project Status/Timeline attached to the appendix below is an estimate only, and will be updated once the project kickoff date has been scheduled and any overhanging issues are resolved to the POC's satisfaction.

14.0 Status/Timeline

Please see Appendix 2.

Appendix

1. Sample form used to qualify the fuel cell for initial start and the project acceptance test.

Installation/Acceptance Test Report

Site: MCBH Kaneohe Bay, HI

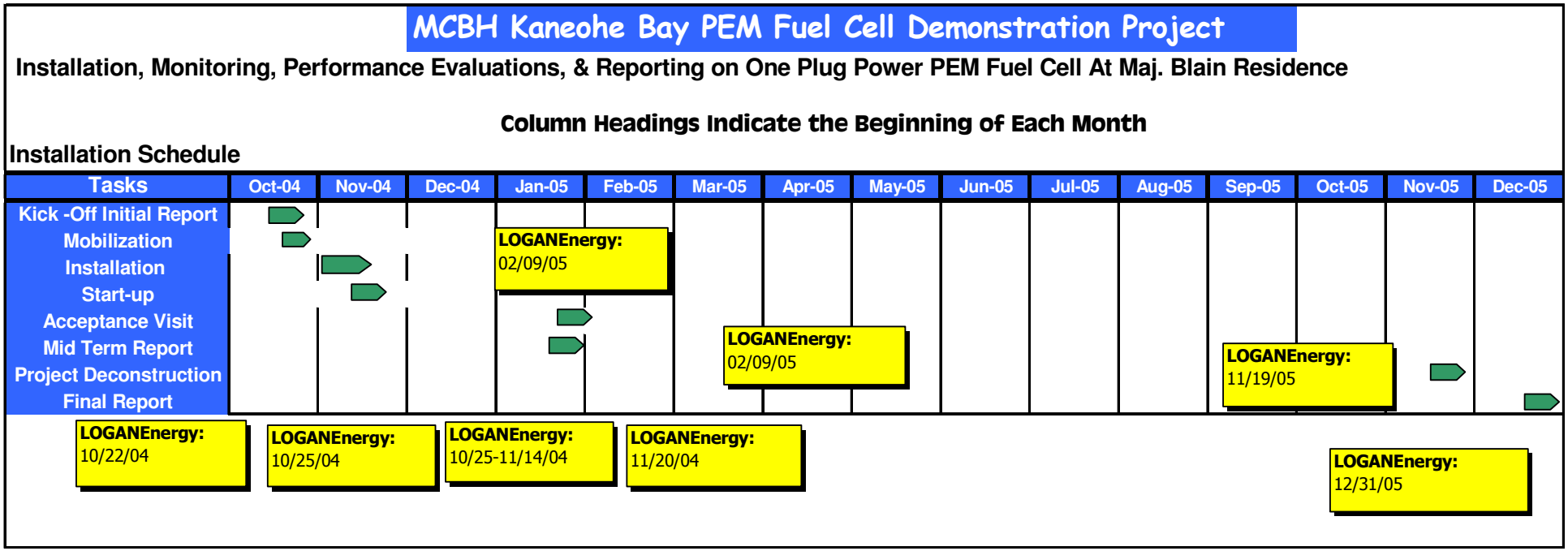
Installation Check List

TASK	Initials	DATE	TIME (hrs)
Batteries Installed	GC		
Stack Installed	GC		
Stack Coolant Installed	GC		
Air Purged from Stack Coolant	GC		
Radiator Coolant Installed	GC		
Air Purged from Radiator Coolant	GC		
J3 Cable Installed	GC		
J3 Cable Wiring Tested	GC		
Inverter Power Cable Installed	GC		
Inverter Power Polarity Correct	GC		
RS 232 /Modem Cable Installed	GC		
DI Solenoid Cable Installed with Diode	GC		
Natural Gas Pipe Installed	GC		
DI Water / Heat Trace Installed	GC		
Drain Tubing Installed	GC		

Commissioning Check List and Acceptance Test

TASK	Initials	DATE	TIME (hrs)
Controls Powered Up and Communication OK	GC		
SARC Name Correct	GC		
Start-Up Initiated	GC		
Coolant Leak Checked	GC		
Flammable Gas Leak Checked	GC		
Data Logging to Central Computer	GC		
System Run for 8 Hours with No Failures	GC		

Appendix 2


MCBH Kaneohe Bay PEM Fuel Cell Demonstration Project
Installation, Monitoring, Performance Evaluations, & Reporting on One Plug Power PEM Fuel Cell At Maj. Blain Residence
Column Headings Indicate the Beginning of Each Month
Installation Schedule
Tasks
Oct-04
Nov-04
Dec-04
Jan-05
Feb-05
Mar-05
Apr-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05
Oct-05
Nov-05
Dec-05
Kick -Off Initial Report
Mobilization
Installation
Start-up
Acceptance Visit
Mid Term Report
Project Deconstruction
Final Report
LOGANEnergy: 02/09/05
LOGANEnergy: 02/09/05
LOGANEnergy: 11/19/05
LOGANEnergy: 10/22/04
LOGANEnergy: 10/25/04
LOGANEnergy: 10/25-11/14/04
LOGANEnergy: 11/20/04
LOGANEnergy: 12/31/05